Stryker Modernization Update (AUSA)

LTC Todd Lamb
PM Development

6 October 2009

NBC Reconnaissance Vehicle (NBCRV)

Anti Tank Guided Missile (ATGM)

Infantry Carrier Vehicle (ICV)

Reconnaissance Vehicle (RV)

Medical Evacuation Vehicle (MEV)

Engineer Squad Vehicle (ESV)

Mobile Gun System (MGS)

120mm Mounted Mortar Carrier (MCV)

Commander's Vehicle (CV)

Fire Support Vehicle (FSV)

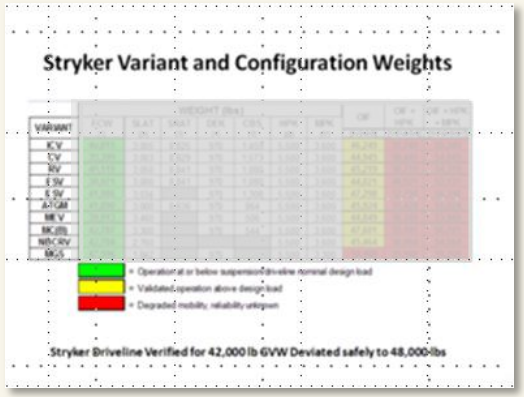
Distribution Statement A: **Approved for public release; distribution is unlimited.**

The Need to Modernize

SPACE

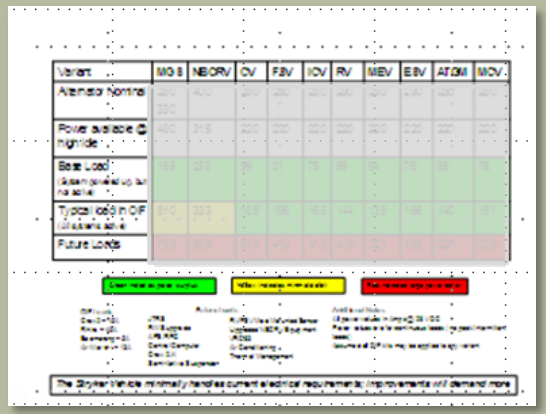
- Multiple Appliqué solutions added; "Scaleable / Kitable Concept" limited
- Kits create both interior & exterior challenges for each carrier variant
  - CREW, GSS/MSS, Armor Upgrades
  - Additional displays/screens
  - 2nd/3rd order effects include weight and power

WEIGHT



- Kits required to address threats
  - IED, RPG, EFP, Sniper, etc
- Only select Kits can be applied
- Deployed configuration weighs more than planned
- Limit Mobility

POWER



- OIF kit loads require some systems to be turned off
- Current Power Generation cannot meet expected future loads
- Silent watch capability impacted
- Excess heat impacts both onboard electronics and Soldier's effectiveness

Current Space, Weight, and Power Capacity Shortfalls require Upgrades to Stryker FoV

Objective: Identifying Vehicle Integration Capabilities and Interdependencies

"Synergized Approach" is key to setting the stage for:
- Robust, efficient and supportable design
- Platform prepped for added capability when needed
- Integrated Fight "HBCT, BCT Modernization..."

Piece-meal approach:
- Lost Synergy
- Size, Weight, Power (SWaP) conflicts
- More retrofits
- Continues "Appliqué" Approach

Suspension / Driveline

- Required to meet Mobility needs
- Required to support the added weight of Power GEN

Power

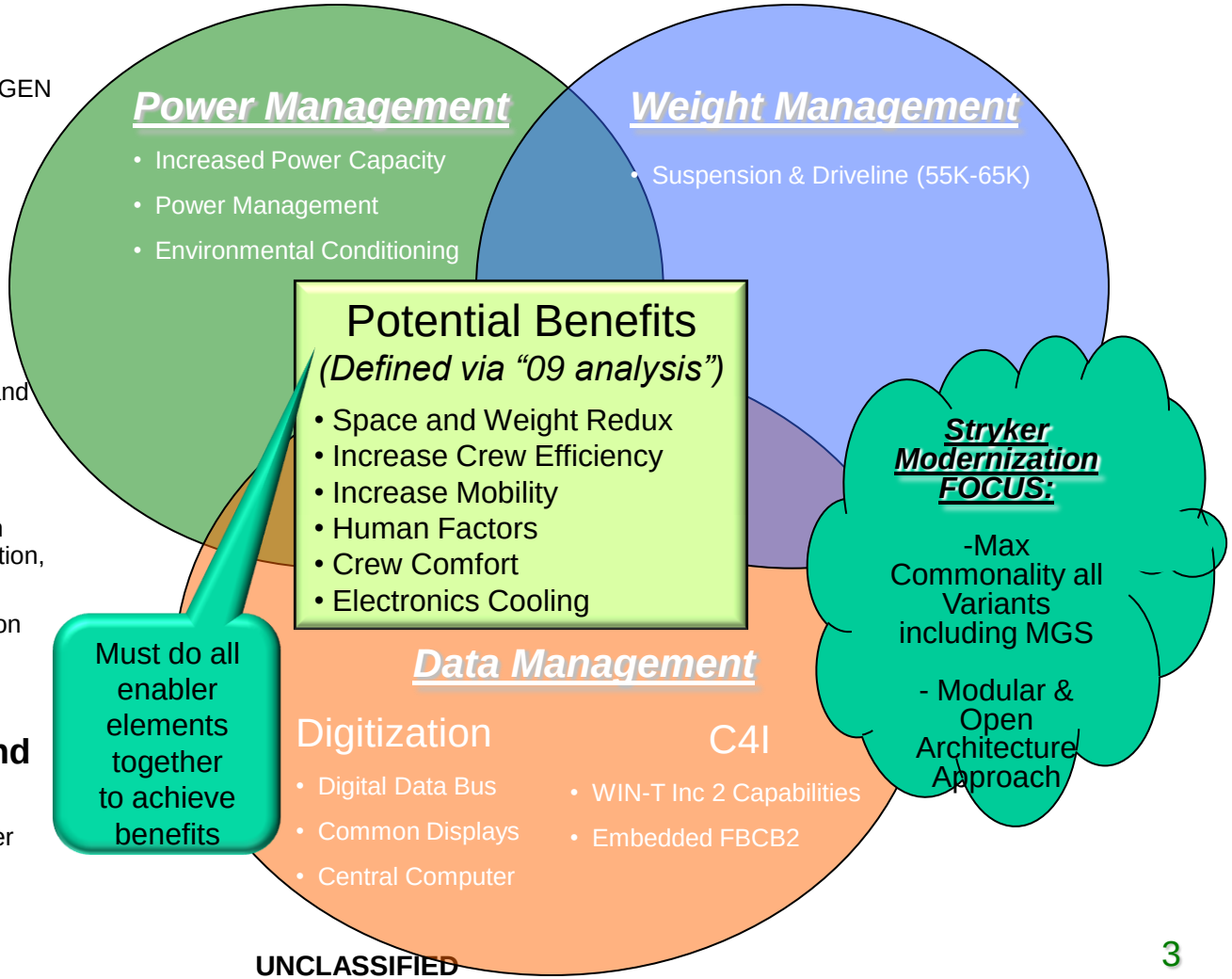
- Provide added power required for Suspension, Digitization and C4I growth
- Power Management required to control Vehicle power to maximize mobility and to meet the needs for silent watch
- Added power required for Environmental Conditioning to cool electronics for Digitization and Embedded C4I

Digitization

- Digital Data Bus is required to connect Common Displays, Multi-Purpose Computers, C4I integration, and Power Management
- Common Displays are required for C4I Integration and to reduce space and weight

C4I (Command, Control, Communications, Computers and Intelligence)

- Embedded C4I reduces space, weight and power requirements
- Embedded C4I increases crew efficiency, and addresses Human Factors needs for the crew



Technology Readiness Levels

(for Hardware and Subsystems)

	Description	
TRL 1	Basic principles observed and reported.	Lowest level of technology readiness. Scientific research begins to be translated into applied research and development. Examples might include paper studies of a technology's basic properties. 
TRL 2	Technology concept and/ or application formulated.	Invention begins. Once basic principles are observed, practical applications can be invented. Applications are speculative and there is no proof or detailed analysis to support the assumptions. Examples are limited to analytic studies. 
TRL 3	Analytical & experimental critical functions and/or characteristic proof of concept.	Active research and development is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative. 
TRL 4	Component and/or breadboard validation in laboratory environment.	Basic technological components are integrated to establish that they will work together. This is relatively "low fidelity" compared to the eventual system. Examples include integration of "ad hoc" hardware in the laboratory. 
TRL 5	Component and/or breadboard validation in relevant environment.	Fidelity of breadboard technology increases significantly. The basic technology components are integrated with reasonably realistic supporting elements so that it can be tested in a simulated environment. Examples include "high fidelity" laboratory integration of components. 
TRL 6	System/subsystem model or prototype demonstration a relevant environment.	Representative model or prototype system, which is well beyond that of TRL 5, is tested in a relevant environment. Represents a major step up in technology's demonstrated readiness. Examples include testing a prototype in a high fidelity laboratory environment, or in a simulated operational environment. 
TRL 7	System/subsystem model or prototype demonstration in a operational environment.	Prototype near, or at, planned operational system. Represents a major step up from TRL 6, requiring demonstration of an actual system prototype in an operational environment, such as an aircraft, vehicle, or space. Examples include testing the prototype in a test bed aircraft. 
TRL 8	Actual system completed and "flight qualified" through test and demonstration.	Technology has been proven to work in its final form and under expected conditions. In almost all cases, TRL represents the end of true system development. Examples include developmental test and evaluation of the system in its intended weapon system to determine if it meets design specifications. 
TRL 9	Actual system "flight proven" through successful mission operations.	Actual application of the technology in its final form and under mission conditions, such as those encountered in operational test and evaluation. In almost all cases, this is the end of the last "bug fixing" aspects of system development. Examples include using the system under operational mission conditions. 

MGS/Modernization Linkage

Oct 09

May 09
VCSA MGS Brief

May-July 09
S-MOD Concept/Requirement Trades PM &TCM

Aug 09
Stryker FoV CSB

Pre Milestone B activities

Apr 09
S-MOD Trade Study Concept

Feb 09
Program impacted by New DoD guidance

Dec 08
MGS CSB

Support to fund Long-Term MGS deficiency mitigation efforts tied to Stryker Modernization for FOV

Sep 08
DAE Update

Law Change (§ 2366a & § 2366b) impact on Program

DAE provides S-PIP authority for Trades

Jun 08
Technology Day Conference

Apr 08

Mar 08

NOV 07
PM SBCT CSB

StEP

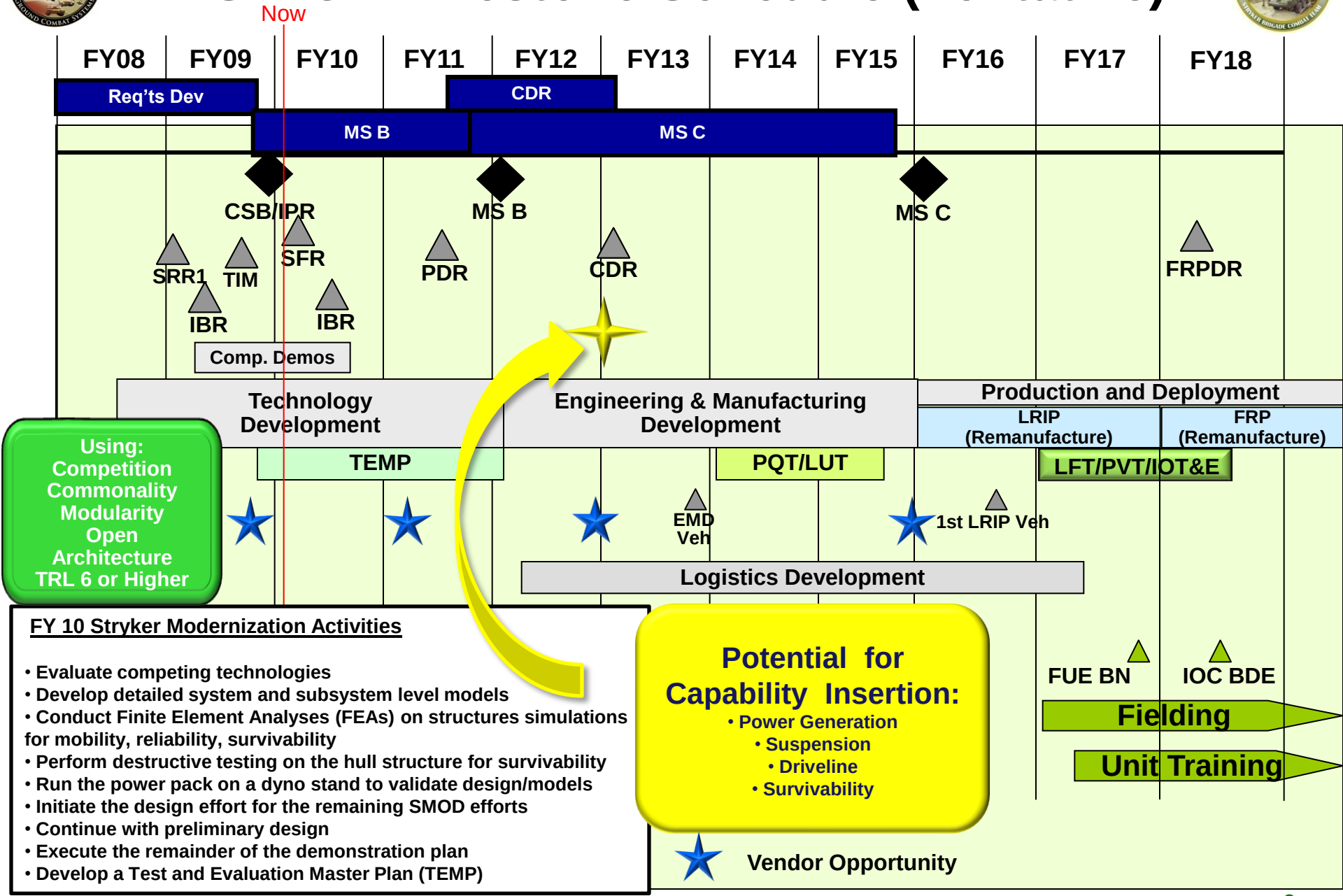
Aug 08
MGS ADM

MGS ADM
- Correct MGS Deficiencies
- Convene an MGS CSB
- Authority to produce 62 MGS Vehicles

Feb 08
MGS DAB

STRYKER

S-MOD Milestone Schedule (Tentative)



FY 10 Stryker Modernization Activities

- Evaluate competing technologies
- Develop detailed system and subsystem level models
- Conduct Finite Element Analyses (FEAs) on structures simulations for mobility, reliability, survivability
- Perform destructive testing on the hull structure for survivability
- Run the power pack on a dyno stand to validate design/models
- Initiate the design effort for the remaining SMOD efforts
- Continue with preliminary design
- Execute the remainder of the demonstration plan
- Develop a Test and Evaluation Master Plan (TEMP)

Technology and Vendor Hardware Evaluation and Selection

Select Technology | **MS B** | **Select Source**

Technology Readiness | *Vendor Readiness*

Requirement 1

- *Technology 1A*
- *Technology 1B*
- *Technology 1C*

Requirement 2

- *Technology 2A*
- *Technology 2B*
- *Technology 2C*

Technology Evaluation

System Specification

System Design

Hardware Evaluation

Component 1B

- *Vendor 1*
- *Vendor 2*
- *Vendor 3*

Component 2C

- *Vendor 4*
- *Vendor 5*
- *Vendor 6*

System Integration

Competition Focus

- LRU Level
- Gov't handles conflicts
- PDR "Shaping Reqts"

Understand Technology

Select Best Value Provider

Understanding technology in Pre-MS B to make trade decisions for effective competition in EMD Phase

S-MOD Draft CDD Incremental Targeted Technologies

Key: Core Enabler; (* = Increment 1); (** = Future Increment)

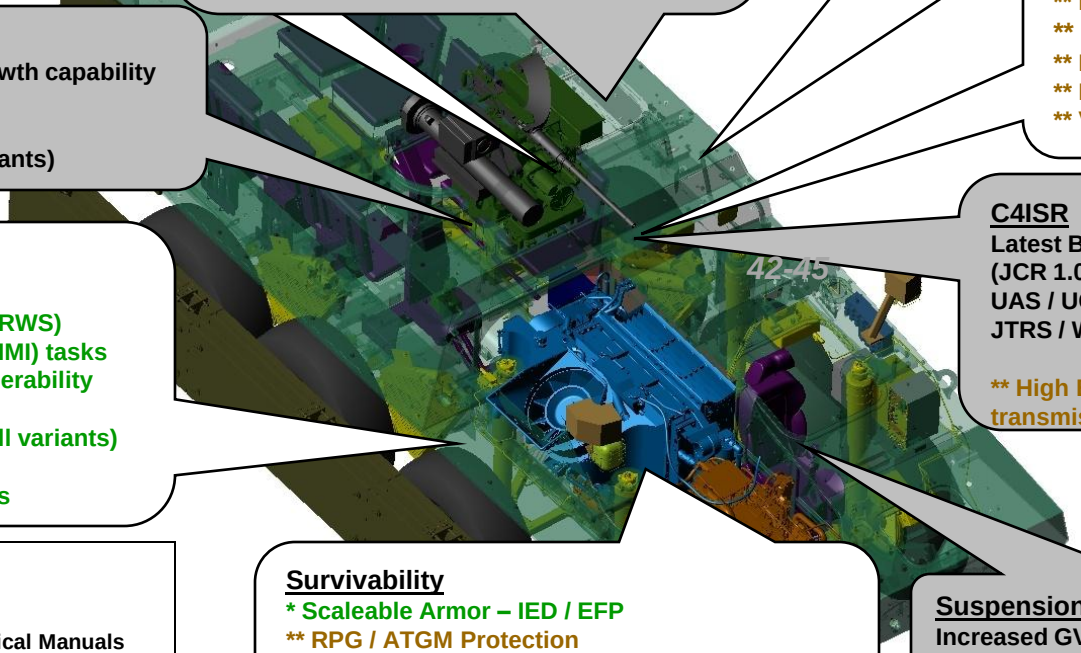
Lethality
* All Crew Served Weapons Slew to Cue
* Gun Shot Detection, Multi-Modal
* RWS Reload under armor
* RWS Javelin
* Far Target Location / Handoff
** 3rd Gen. FLIR or Improved Microbolometer
** NLOS Capability

Vehicle Digitization
Single Point Downloader for all LRU's
MGS Slip Ring
Central Computer / Databus
Common Displays (any function anywhere)
Digital Driver Instrument Panel
Embedded Applications (e.g. FBCB2, BFT)
GSS / MSS Integration
* MGS Color Display

Condition Based Maintenance & Support
* Ammo & Fuel Reporting
* Portable Display for PMCS and IETMs
* Embedded IETMs
* LRU Status
* High Bandwidth Wireless Data Transmission (CASII)

Power Generation System
Increased power generation with growth capability
Smart power management system
Non Primary Power (APU)
Environmental Conditioning (All Variants)

MEP
** MGS Turret Digitization
** MGS Data Link for MP Ammo
** NBCRV Block 2 Sensors
** ESV Tele-operations
** Vehicle MEP Digitization



C4ISR
Latest Battle Command software (JCR 1.0)
UAS / UGS Integration
JTRS / WIN-T Integration

** High Bandwidth, wireless data transmission (CASII)

Embedded Training
* Direct Driver Input
* Improved Gunnery Training (MGS, RWS)
* Interactive Multimedia Instruction (IMI) tasks
* Planned MILES XXI & TESS Interoperability
* Combat Maintainer Tasks
* Multi-Vehicle Collective Training (all variants)
* Mission Rehearsal
* Interoperability with C4ISR Systems

Survivability
* Scaleable Armor – IED / EFP
** RPG / ATGM Protection
* Mine Blast Attenuating Seats
* Non Flammable Tires / Tire Fire Suppression
* 360 Situational Awareness
** Masted Sensor (RV/FSV)

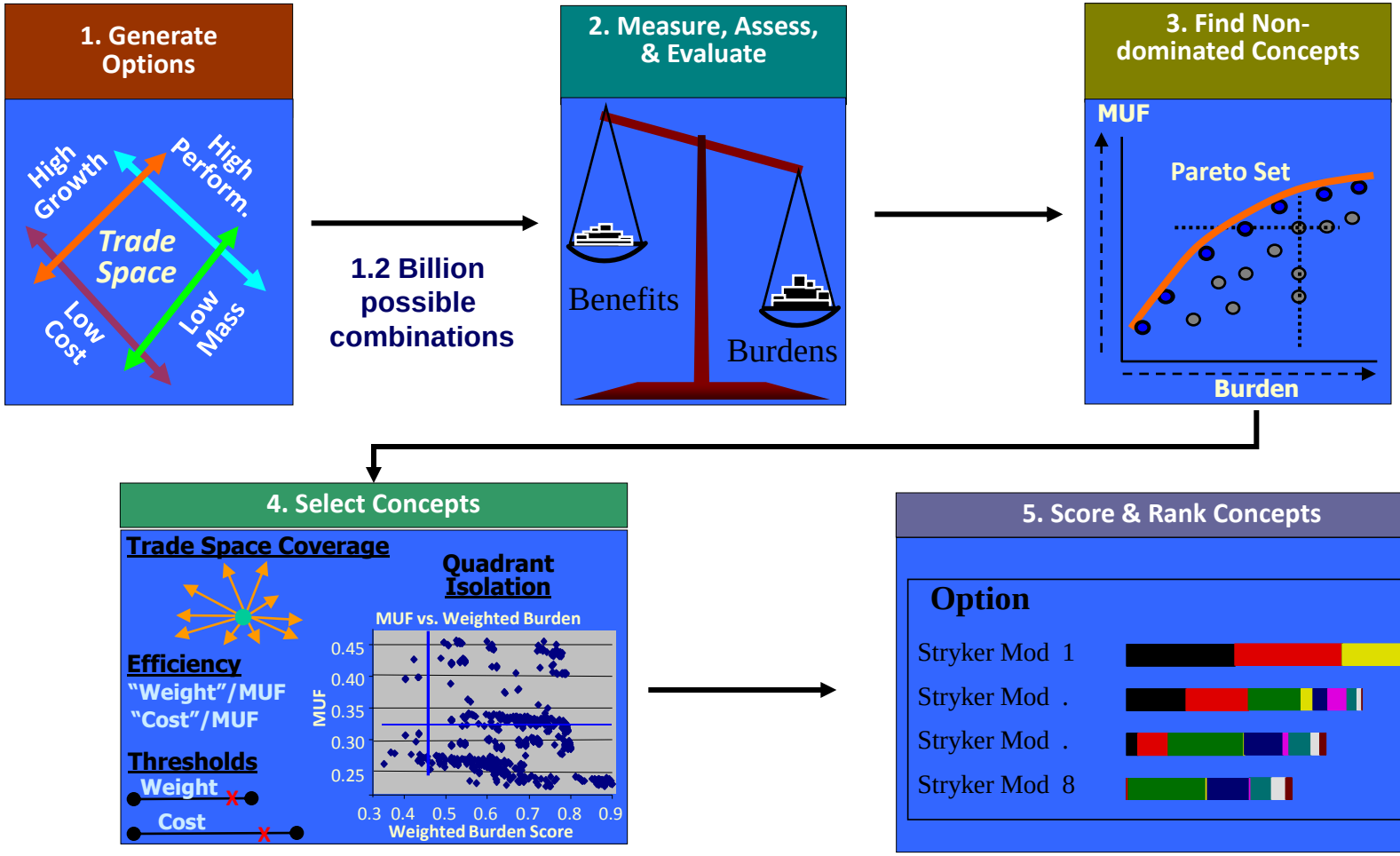
Suspension and Driveline Upgrades
Increased GVW capacity (55k-60k lbs)
Semi-Active Suspension

Legend

ATGM – Anti Tank Guided Missile
GSS – Ground Soldier System
IED – Improvised Explosive Device
IETM – Integrated Embedded Technical Manuals
JCR 1.0 – Joint Capability Requirement 1.0
JTRS – Joint Tactical Radio System
MMS – Mast Mounted Sensor
MSS – Mounted Soldier System
NLOS – Non Line of Sight
RPG – Rocket Propelled Grenade
RWS – Remote Weapon Station
UAS / UGS – Unmanned Aerial / Ground System
WIN-T – Warfighter Information Network - Tactical

Enablers provide the foundation for continued product improvements (full CDD)

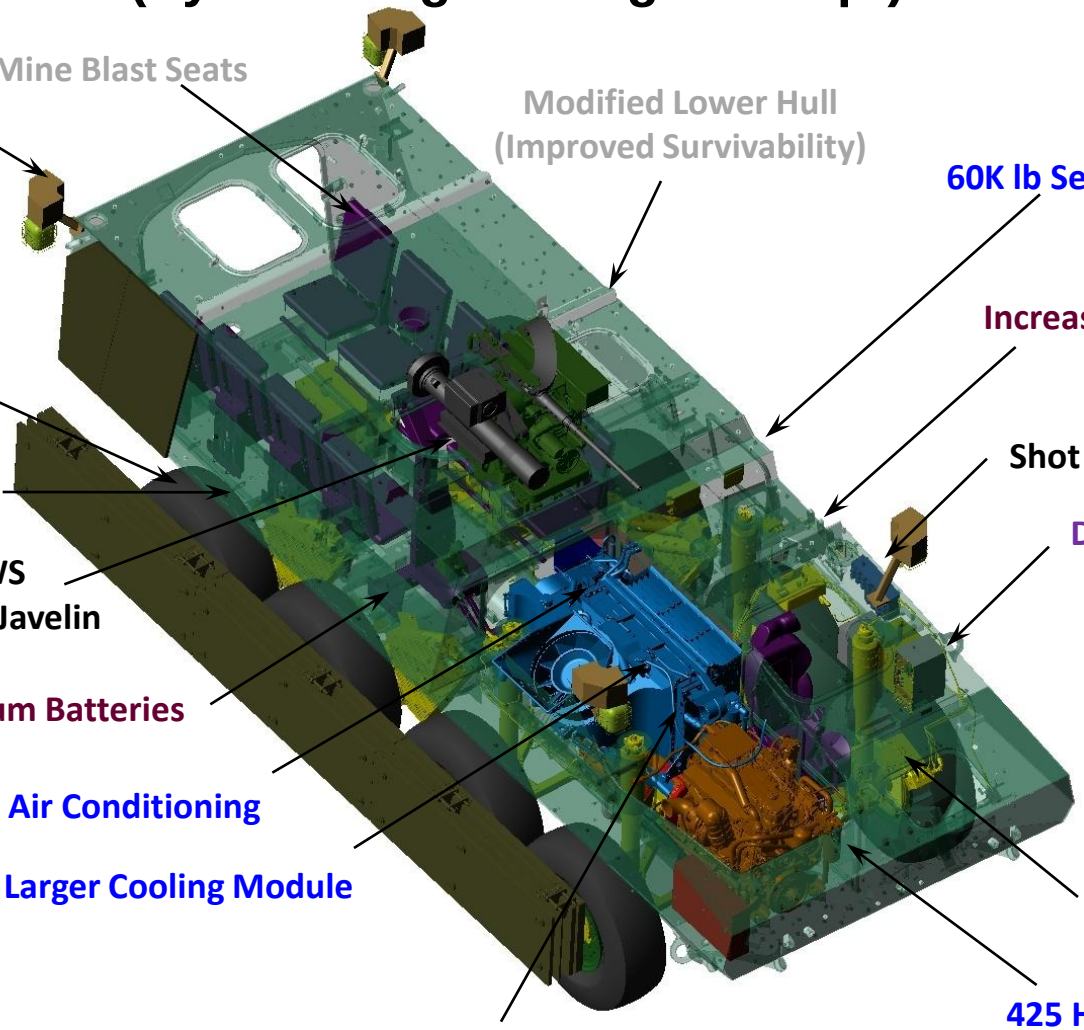
S-MOD Whole-System Trade Study



Identified 8 best conceptual solutions

Select Optimal Performance Solutions Within Size, Weight, Power and Cost Constraints

Stryker Modernization
(System Engineering Concept)



360 SA

Mine Blast Seats

Modified Lower Hull
(Improved Survivability)

60K lb Semi Active Suspension

395/85R20 Tire
with axle spacing
change

Increased Electrical Power
Generation

Tire Fire
Suppression

Shot Detection

Data/Video Network

Improved RWS
S2C / FTL, limited Javelin

Lithium Batteries

Air Conditioning

Larger Cooling Module

Digital DIP

425 HP
New Engine

Improved Embedded Training

Enablers

- Driveline/Suspension
- Power Generation
- Data Management
- Survivability

SE Process/Trades produced concept that meets majority of CDD requirements

Stryker Modernization Summary

1. **Conduct Pre Milestone B activities**

2. **Stryker Modernization efforts –**
   - Army concurs with Stryker Modernization approach and working to get OSD concurrence

3. **Additional Industry Day being planned for 2010**